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ABSTRACT

Prepared by an instructor and curriculum specialists, this course of study was designed to meet the individual needs of the dropout and/or hard-core unemployed youth by providing them skill training, related information, and supportive services knowledge in machine tool operation. The achievement level of each student is determined at entry, and small instructional units provide continuing positive reinforcement and minimize frustration. Training in machine tool operation stresses the development of skills through practical experiences. Machines used include the drill press, engine lathe, bench grinder, surface grinder, cutoff saw, and vertical and horizontal milling machines. Upon completion of this training the student is qualified for a variety of entry level positions in machine shops. Brief descriptions of other instructional areas, teaching techniques, material utilization, motivational devices, and case studies are appended. Related materials are available as VT 011 518-VT 011 533 in this issue. (GR)

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COURSE DESCRIPTION

MACHINE TOOL OPERATION

TOOL

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THE MINNEAPOLIS
PUBLIC SCHOOLS

WORK OPPORTUNITY CENTER
107 Fourth Street Southeast
Minneapolis, Minnesota 55414

1969

MACHINE TOOL OPERATION

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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INTRODUCTION

In May 1966 the Minneapolis Public Schools received a Federal Grant under section 4C (Research) of the Vocational Education Act of 1963. This grant was provided to finance an educational endeavor designed to meet the individual needs of the dropout and/or hard-core unemployed youth in the 16 through 21 year age group in terms of skill training, related information and supportive services.

Funds are also received from the Minnesota Department of Vocational Education, Title III of the National Elementary and Secondary Education Act, and the Minneapolis Public Schools. All certificated personnel at the Work Opportunity Center must be vocationally certified under the Minnesota State Plan for Vocational Education.

It was felt at the outset that if we were to deal effectively with students in school, it would be necessary to help them deal with their problems out of school. At the present time the WOC staff numbers fifty. Included are personnel in guidance, work coordination, social work, research, health, clerical, building maintenance, and administration.

Facilities are provided in the following areas: Business Education, Communications (related), Creative Art, Drafting (related), Dry Cleaning, Electricity and Electronics, Food Preparation and Service, Homemaking (clothing and interior decorating), Homemaking (personal improvement and foods), Machine Tool Operation, Marketing and Merchandising (retail sales), Mathematics (related), Nurses Aide and Hospital Orderly, Offset Printing, Reading (remedial and developmental), Service Station Attendant and Light Automotive Maintenance, Small Engine Maintenance and Repair, and Social Communications (related). Brief descriptions of these instructional areas appear in Appendix A of this report.

Because of a general and local need for workers in nearly all occupations, the selection of technical course offerings was based largely on kinds of occupations, i.e., those in which a worker has good opportunities for advancement if he has the ability and desire to do so.

Because this report is concerned with the curriculum of a particular instructional area, program descriptions of supportive services are not included. This information is available in the WOC Summary Report of Activity and Research for the period May, 1966 to June, 1968.

The basic differences between instruction at the WOC and in conventional schools are in the setting and the approach.

The setting is a non-school type building with an informal, relaxed atmosphere. Class size is small. No one is ever too busy to give a student some of his time when the student needs it. The unique feature of our "rules and regulations" is that they are either functional or non-existant. The Student Advisory Committee has a strong voice in determining the rule structure at WOC and its implementation. A basic requirement is that a student be enrolled in a technical area. Other than that, decisions are made by students, with all the help they need or will accept from teachers, counselors, social workers, work coordinators, clerical staff, and administration.

The approach focuses on the individual. His needs are paramount. Each student is accepted as he is. His level of achievement or performance is determined, not assumed. He is taken from where he is and is assisted as far as he will go in the shortest possible time. No instructor or student is burdened with a standardized curriculum or a fixed set of materials. Grades are not used. Content is broken down into small instructional units in order to provide continuing positive reinforcement

and to minimize frustration. Successes, however insignificant, are emphasized. Instructors are sincere in their efforts with students for two reasons: 1. Teacher selection was based largely upon the possession of this characteristic of sincereity and, 2. An instructor without a sincere approach would soon have an empty classroom, for the only "hold" he has on his students are the relationships he can establish with them. These positive relationships are not always easy to establish, in fact, are not established at all in some cases (we also have our dropouts).

A listing of techniques, materials, and motivational devices that have been selectively utilized by WOC staff appear in Appendix B of this report.

The results of this kind of an approach are satisfying when evaluated in terms of positive attitudinal changes over a period of time. An outstanding example is the fact that in a school population where approximately one-fourth of the students are on probation or parole, and nearly all have dropped out of the conventional school, there has not been one discipline problem in a classroom or training area.

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Table of Contents

MACHINE TOOL OPERATION

	Page
Statement of Objectives	1
Attainment of Objectives	4
List of Instructional Topics	8
Annotated Bibliography	10
Appendix A	
Brief Descriptions of Work Opportunity Center Instructional Areas	A-1
Appendix B	
Techniques, Materials, and Motivational Devices	B-1
Appendix C	
Case Studies	C-1

STATEMENT OF OBJECTIVES

To develop in each student:

1. An active interest in, and understanding of, the machine shop trade.

2. An appreciation of good design and quality workmanship.

3. Desirable work habits and attitudes.

4. The skills and knowledge necessary for entry level jobs in the machine shop trade.

OBJECTIVE 1

To develop in each student an active interest in, and understanding of, the machine shop trade.

A student achieving this objective will:

1. Have a knowledge of current and future job opportunities in this field.
2. Be familiar with the duties of various workers in this field.
3. Understand the importance of this field in an industrial society.
4. Know about apprenticeship programs and labor organizations.

OBJECTIVE 2

To develop in each student an appreciation of good design and quality workmanship.

A student achieving this objective will:

1. Recognize and understand the importance of good design.
2. Have a feeling of pride in a job well done.
3. Know the importance of accuracy, timing, and production efficiency.
4. Attempt to increase his knowledge and improve his skills.

OBJECTIVE 3

To develop in each student desirable work habits and attitudes.

A student achieving this objective will:

1. Work cooperatively with others.
2. Follow directions and be able to accept constructive criticism.

3. Develop self-confidence.

4. Work industriously and effectively.

5. Know and apply the principles of shop safety.

OBJECTIVE 4

To develop in each student the skills and knowledge necessary for entry level jobs in the machine shop trade.

A student achieving this objective will:

1. Read and understand simple blueprints.

2. Be able to make simple layouts.

3. Use and care for hand tools properly.

4. Measure accurately with a variety of measuring devices common to this field.

5. Have a working knowledge of commonly used materials.

6. Perform basic operations and setups and be able to care for the following machines:

   a. Engine lathe.

   b. Vertical and horizontal milling machines.

   c. Surface grinder.

   d. Drill press.

   e. Grinder.

   f. Cutoff band saw.

   g. Band saw.

ATTAINMENT OF OBJECTIVES

When a student enrolls at the Work Opportunity Center he takes part in an intensive two day orientation session. During this time the student is made aware of the total WOC program. Included are explanations of each area, a guided tour, a session on programming, and scheduling. This is presently done on Thursday and Friday with the student entering classes on Monday.

When new students enter the machine shop training area, they receive individual or small group orientation into our shop situation. No two students are alike. Most have dropped out of high school, have limited verbal and numerical skills, and usually need a great deal of work in the area of work attitudes. Some, however, are highly motivated, possess high aptitudes, and progress rapidly from one operation to the next. There is a wide range of ability and temperament. One factor they seem to hold in common is their need for personal attention and supervision. As a result, it has been found necessary to limit class size to ten or twelve students with no more than two or three of these being beginners.

The instructor learns as much as he can about a new student as soon as possible. This is done by conversing with him. It is helpful if student and instructor can discover some common interest, the goal being to get the student to relax and feel some confidence. Some students can be pushed through the course, others must be pulled. An effort is made to treat them with kindness and firmness, much as one would treat employees working in an actual machine shop.

Each student is guided toward the part of the trade that he favors. When this has been accomplished he can then be broadened into other areas not necessarily pertaining to this field. If the student becomes interested

in another field an effort is made to help him gain his goal.

Before a student begins actual work on a machine, he is required to pass a shop safety test. Most have little difficulty with it. Only a few have been unable to read or understand it and they were then tested orally.

Students are usually started on the lathe. Each receives a thorough explanation and demonstration on the lathe, including its purpose, function, and hazards. The need for a sharp and properly ground tool bit is pointed out. Their first operation then becomes one of grinding a conventional tool bit. They are then shown again how to set up and use it properly. Initially they operate the lathe with manual controls, later when they are more proficient, they learn the use of the automatic controls. Measurement is introduced so that stock may be turned accurately within certain limits. Use of three and four jaw chucks, grinding thread cutting tool bits, cutting threads, turning between centers and cutting tapers are also covered. At this point the student chooses a project to work on or is assigned a shop project.

When a job requires a procedure that the student is not familiar with a step-by-step demonstration is given. Supervised practice follows each demonstration. Use of other machines is covered in a manner similar to the lathe.

Safety in the shop is stressed continually throughout the course. Attractive posters are used. Each safety requirement is explained in detail to the student.

Gaining students' respect enables one to sharpen their interest and obtain their best performance. It is necessary to be sincere, to take time to be human - to converse, share jokes, listen to concerns. These factors make possible a closer partnership that is often difficult to

attain in a crowded shop geared to maintaining strict discipline and punctuated by passing bells and groups moving in and out.

The demonstration method with oral instruction has been most successful. Students like and seem to need the personal attention that this teaching method necessitates.

The shop is conducted much like a shop in the field. The importance of accuracy and reliability is stressed. Each student has his job or project to work on. The instructor acts as a foreman on the job. When a student has a problem that he asks about he is often helped toward a solution by further questioning and discussion.

Projects are selected that require lathe work and milling. In this way the student learns machining operations in conjunction with production sequences. This applies to operations on other machines as well.

Students occasionally are made aware of mass production problems by serving as production line operatives. The instructor serves as the set-up man and the students operate the machines in producing the items. Students criticize each other as production problems arise and are solved. An activity of this kind makes each student a very necessary part of the activity and emphasizes the importance of being able to work cooperatively with others.

Recently about one-hundred and forty students were selected from six junior high schools in Minneapolis to attend classes for two hours a day at WOC. These students were selected as potential dropouts that might benefit from a change of scene. Students were programmed into a technical area. Related instructors were assigned to various technical areas where the best use could be made of their talents. The program was to run for eleven weeks.

Although it is a bit early to draw conclusions, several observations may be noted.

1. Students are attending more regularly than before they came to WOC.
2. Feedback from the various junior high schools is favorable.
3. Positive changes in students' attitudes and behavior are obvious after only a few weeks.
4. Most students are interested and actively involved in their areas. More than ninety percent said they would like to participate in a second session.

INSTRUCTIONAL TOPICS

1. Orientation to Machine Shop
2. Safe Work Practices
3. Grind a drill bit
4. Set up drill press and vise - drill holes
5. Ream in drill press
6. Cutting fluids or coolants
7. Hand Ream
8. Design and workmanship
9. Grind a lathe tool bit
10. Dress a grinding wheel
11. Lathe parts
12. Align lathe centers
13. Cutting speeds and feeds
14. Read blueprints
15. Rough turning
    a. between centers
    b. in chuck
16. Finish turning
    a. between centers
    b. in chuck
17. Kinds of tapers
18. Cut tapers
    a. compound method
    b. offset method
19. Knurling on the lathe
20. Boring on the lathe

21. Cut external screw threads on the lathe

22. Clean and maintain the lathe

23. Cut threads with taps and dies

24. Characteristics of materials

25. Measurement and layout

    a. Micrometer caliper

    b. Vernier caliper

    c. Dial vernier caliper

    d. Scale

    e. Protractor

    f. Surface gauge

    g. Angle plate

    h. Surface plate

    i. Thread gauge

26. Job requirements

27. Getting along on the job

28. Filing techniques

29. Milling machine parts - vertical, horizontal

30. Square milling head to table

31. Set vise parallel to table

32. Mill a flat surface

33. Boring on the milling machine

34. Mill angles

35. Mill a slot in round stock

36. Clean and maintain the milling machine

37. Cut stock on cutoff band saw

38. Grind a flat surface

39. Cut stock on band saw

40. Select and change speeds on band saw

SELECTED ANNOTATED BIBLIOGRAPHY

BOOKS

Allen, Dell K., Metallurgy Theory and Practice. Chicago: The American Technical Society, 1969.

An excellent teacher reference covering the properties and characteristics of a variety of metals. Somewhat advanced for our students.

Johnson, Harold V., General-Industrial Machine Shop. Peoria: Charles A. Bennett Co., Inc., 1963.

This book is a good student reference. It is well illustrated and contains clear explanations of machines, parts, and processes. For students that are interested it brings historical and industrial relationships into focus.

Oberg, Erik, and Franklin D. Jones, Machinery's Handbook, 17th edition. New York: Industrial Press Inc., 1966.

An indispensable teacher reference containing hundreds of pages of useful tables, formulas, etc.

Walker, John R., Modern Metalworking. Homewood, Ill.: The Goodheart-Wilcox Co., Inc., 1965.

This book includes basic information on tools, materials, and processes used in metalworking occupations.

PERIODICALS

Modern Machine Shop. Gardner Publications, Inc., 600 Main St., Cincinnati, Ohio. Published monthly.

Steel. The Penton Publishing Co., Cleveland, Ohio. Published weekly.

Both of these periodicals are helpful in keeping up-to-date in the field. They cover new developments in machines, materials, and processes.

APPENDIX A

BRIEF DESCRIPTIONS OF WORK OPPORTUNITY CENTER INSTRUCTIONAL AREAS

BUSINESS EDUCATION

Instruction is offered in typing, filing, bookkeeping, record keeping, and in the use of small calculators, key punch machines, and office duplicating equipment. All instruction is based on current business practice. There are many positions open to students who complete this training. Included are jobs as typists, file clerks, receptionists, and key punch operators.

COMMUNICATIONS (related)

Students work individually at improving their oral language usage, writing skills and study habits. A wide variety of printed materials, audio-visual equipment and materials, and the use of individual study carrels facilitate student progress. Work may be directed toward transfer credit, GED test preparation, or job related skills.

CREATIVE ART

Students work independently. Individual instruction is provided with a wide variety of materials and equipment. The goal is the development of confidence in the areas of decision making, self-expression, and evaluation in art and everyday life. Within this framework, a student may study in depth or he may explore several areas.

DRAFTING (related)

Students taking this course learn the basic elements of drafting. The instructor cooperates closely with the teachers and students in the machine tool operation and electricity and electronics areas in order to teach the drafting and blueprint reading related to these specialized occupations. There are many positions open to machine draftsmen. The skills involved are also basic to a variety of related jobs. Qualified students are referred to area vocational schools, technical schools, or apprenticeship programs for further training.

DRY CLEANING

Students in this area are instructed in all phases of operation of a modern dry cleaning plant. They are encouraged to specialize if they express a desire to do so. Instruction in marking, invoicing, and customer service is handled by the marketing and merchandising teacher. Students can learn basic tailoring and garment repair in the sewing section of the homemaking area. Persons possessing these skills are in great demand in the Minneapolis, St. Paul area.

ELECTRICITY AND ELECTRONICS

This course provides instruction in the fundamental principles of electricity and electronics. Topics include codes, laws, terms, and techniques common to this field. Modern testing equipment is used to diagnose and locate problems in radio and television receivers in order to complete necessary adjustments or repairs. With the present rapid expansion of this field, persons with basic knowledge and skills have little difficulty finding positions in production, service and repair or in advanced training programs.

FOOD PREPARATION AND SERVICE

Students in this area are instructed in the preparation and serving of soups and sauces, vegetables, meats, desserts, and breads. They also gain experience in selecting, ordering, receiving, and storing foods. Instruction is given in proper methods of setting tables and serving customers for those interested in this phase of the industry. Students completing this course are qualified to work in one or more of the following positions: salad worker, short order cook, cooks helper, kitchen worker, bakers helper, and waitress or waiter.

HOMEMAKING (clothing and interior decorating)

Students in this course receive instruction and practical experience in the areas of sewing, garment selection, and home and money management. Other units include interior decorating and related crafts. A special unit in basic tailoring is available for men that are learning dry cleaning. Students may use these skills in their own homes or as a basis for a variety of related occupations.

HOMEMAKING (personal improvement and foods)

Students taking this course work independently in the following areas: personality development, health improvement, foods, and marriage and family living. Topics covered within these areas include proper diet, exercise, grooming, wardrobe care and planning, visual poise, home food preparation, infant care, etc. Young men or women may select one or more parts of this program according to their interests or needs.

MACHINE TOOL OPERATION

Training in machine tool operation stresses the development of skills through practical experiences. Instruction is also provided in related topics. Machines used include the drill press, engine lathe, bench grinder, surface grinder, cutoff saw, and vertical and horizontal milling machines. Students completing this training are qualified for a variety of entry level positions in machine shops.

MARKETING AND MERCHANDISING (retail sales)

Emphasis in this course is placed on retail sales. Theoretical and practical instruction is provided in clerical skills, duties of salespersons, the selling process, and human relations. Review and practice in mathematics and communications is arranged when necessary. Two specialized areas included are cashier-checker and dry cleaning counter girl training. Many full and part-time positions are available to students possessing skills in the field of retail sales.

MATHEMATICS (related)

Instruction is provided on an individual basis for students who desire mathematics related to their technical interests. Work in this area may also be directed toward a high school diploma or the GED certificate. A stimulating variety of materials and methods are used to present theory and practical application.

NURSES AIDE AND HOSPITAL ORDERLY

Students taking this course are instructed in the knowledge and skills necessary for working as aides or orderlies in hospitals and nursing homes. Six to twelve hours a week are spent caring for patients in hospitals or residents in nursing homes. This experience is also valuable to students in home situations.

OFFSET PRINTING

This course provides training in offset printing and related darkroom procedures. Instructional units include composition and layout, process camera operation, stripping, plate making, small press, and finishing operations. Minnesota ranks very high nationally in the number of workers employed in the graphic arts industry. Students completing this course find many entry level positions open to them.

READING (remedial and developmental)

The specific nature of each student's reading problem is diagnosed. A program for remediation or improvement is designed by the instructor and student. A variety of equipment and material is used, ranging from that suitable for very disabled readers to that useful with students reading at the college level. An effort is made to relate classroom experiences to the technical area in which the student is enrolled. Emphasis is placed upon individual contact, with each student given continuing encouragement in his efforts to improve.

SERVICE STATION ATTENDANT and LIGHT AUTOMOTIVE MAINTENANCE

Training in this area is carried on in a WOC operated service station that is open to the public. Instruction is provided in driveway sales, lubrication, engine tune-up, brake work, and other repair and maintenance tasks short of major overhaul or body work. Students may receive related instruction in mathematics, sales, accounting, communications, etc. at the Center in addition to the related units taught at the station.

SMALL ENGINE MAINTENANCE and REPAIR

Persons enrolled in this course work independently on a variety of WOC, student, and customer owned two and four cycle gasoline engines. Instructional units in servicing, adjustment, repair, and overhaul are included. Students seeking employment in this field or those having to operate small gasoline engine powered equipment benefit greatly from this instruction.

SOCIAL COMMUNICATIONS (related)

Student interests and needs are given primary attention. The course offerings include independent study in psychology, government, labor unions, human relations, etc. A large number of references and audio-visual aids are available for student use. Instruction is presented on an individual basis as well as in small discussion groups.

APPENDIX B

TECHNIQUES, MATERIALS, AND MOTIVATIONAL DEVICES

Techniques, materials, and motivational devices that have been selectively utilized by Work Opportunity Center staff are listed below.

TECHNIQUES

1. Teacher-student talks. Teachers endeavcr to determine where a student is, achievement-wise, and work with him from that point.

2. Subject matter content is divided into short instructional units, one-half to two or three hours in length.

3. Students are praised for completing a task or short unit. They may receive awards of merit for completing groups of units three or four weeks in length.

4. Students are often allowed to make their owr choice as to what materials they will read or study.

5. Work and a record of progress is frequently kept up to date by the student. Self-evaluation - kept in individual student folders.

6. Teachers encourage students to move on to successively difficult tasks when success has been achieved on easier ones.

7. Open door policy - a student may come in anytime either to work or ask a question. Students are, however, encouraged to attend classes as they are scheduled.

8. Frequent, well organized field trips. Students decide where to go and what to look for.

9. Students are asked to make written comment on what they read - little correction - emphasis is placed on ideas and expression, not on grammar, spelling, etc. - teacher learns from and about student.

10. Compliments received concerning performance, attitude, etc. are shared with the student or students involved.

11. Good attendance is encouraged - emphasis is placed on days attended, not days missed.

12. Students keep own attendance by signing in and out of class.

13. Students are occasionally given blocks of work and allowed to progress as fast as possible.

14. Students are urged to call in when they are going to be absent. If a student doesn't call, the instructor or outreach worker calls the student. The emphasis is on better attendance, not excuses.

15. Classroom atmosphere is informal, relaxed, conducive to self-expression. Adverse competition is all but eliminated.

16. Student participation in planning the next day's work increases attendance.

17. Success is increased greatly when class size is kept small. This permits more individual attention, closer supervision, and programs of instruction tailored to individual needs and rates of learning.

18. Teachers notify intake personnel when they feel their class is full. The class size varies with the amount of individual attention each student needs. When the teacher can work with more students they are assigned.

19. Incoming students are given a brief test to determine reading level. Instructors are made aware of each student's reading ability. Students may also be programmed into a remedial or developmental reading situation.

20. Student and teacher work out the fine points of scheduling - agree on short and long-term goals.

21. The programming of students and jobs through the shop is done in the manner followed in industry.

22. Length of class periods and courses are flexible - depends on student proficiency and attitude.

23. Each individual is accepted as worthy regardless of personal appearance, manner of dress, or personality characteristics that may seem negative.

24. The use of advanced students to assist in the instruction of newer students has positive effects on both.

25. Instructors endeavor to establish a "helping" relationship..."I am going to help you get ready for this job." This approach emphasizes "partnership" in learning.

26. Every effort is made to get the students "doing" as soon as possible.

27. Two or more training areas may cooperate in teaching several phases of a course, e.g. Dry Cleaning - Marketing and Merchandising - Homemaking (sewing).

28. Lecturing, preaching, bossing, or threatening by the instructor is avoided.

29. Students are allowed to clean and press their own clothes or those of their family. They become much more critical of their work in these cases.

30. Homework is not assigned unless a student expresses a desire for it.

31. Most technical areas require very little reading or written work. Emphasis is placed on performance.

32. New students enter the program every week.

33. An intensive two-day orientation program is designed to made students feel comfortable in a new setting.

34. Students in the food preparation area plan a menu for the week and then prepare all of the food. Cafeteria-classroom is open to the public.

35. When a student exhibits greater than average interest in an area or department he is encouraged to specialize.

36. Regular office desks and equipment are used in Business Education. Room is arranged like an office.

37. Students are encouraged to accept their peers.

38. Students are asked to underline words or phrases in paperbacks or magazines. The instructor and student then go over these together.

39. The Marketing and Merchandising area is organized like a retail store using regular store equipment.

40. Students are never told that they are not capable of certain things. They are expected to perform. When necessary, realistic alternatives are presented.

41. Dry Cleaning - the use of student planned weekly "Specials", e.g. two skirts for the price of one. This enables students to polish their skills on selected kinds of garments.

42. Instructors avoid negative or emotional reactions.

43. Kindness is shown toward students. They are cared about. Emphasis is on the positive.

44. Instruction is personalized. Students' pictures or portraits (pencil sketches) are posted. Student dress is admired and commented favorably upon if it is in good taste.

45. Students are encouraged to get more education and training.

46. Tape recorders are used to improve oral language usage.

47. Students are shown a process, then allowed to try it themselves. If necessary, they are shown again. They are much more receptive the second time.

48. A manikin is used for student demonstration work in nurses aide classroom.

49. Nurses Aide students receive practical experience in a hospital or nursing home under the supervision of the instructor. They are encouraged to develop their own techniques in handling patient problems.

50. Overhead projectors are used for small group presentations.

51. In creative art demonstrations and/or experiments are carried out by a student or the instructor. This has the effect of motivating other students to try their hand at another art-form.

52. Tests, when used, show a student what he has learned. They are not used to determine grades. Grades are not given.

53. Marketing and Merchandising students learn about qualities of cashiers by going to stores and rating the cashier that waits on them.

54. An attempt is made to have each student learn something new each day.

55. Individual work station tool panels aid shop efficiency and have reduced loss of tools.

56. Student comments or criticisms are accepted with the idea of improving content, techniques, etc.

57. Emphasis is placed upon learning concepts through experiences rather than reading about them.

58. High quality work is encouraged and expected rather than just enough to "get by".

59. Entry and subsequent tests in Business Education are used to show the student what gains he has made.

MATERIALS

1. Short, instructor-produced, materials have been developed on a variety of topics.

2. Pamphlets and paperbacks are used extensively in several areas.

3. Selected materials in related subjects are directed toward the student's vocational interest area.

4. Several newspapers and a large selection of current magazines are used in Reading, Communications, Homemaking, and Social Communications.

5. An individual study sequence in psychology is used in Social Communications that helps promote self-understanding.

6. A series of questions, the answers to which can be found in current magazines, pamphlets, almanacs, atlases or filmstrips.

7. Students select and study materials with large print more often than those with small print.

8. Government Printing Office publications are used in nearly all areas.

9. Language lessons are used that employ local examples and student written sentences.

10. Trade and industrial publications are used in the technical and related areas.

11. No single textbooks are used. Reference materials are available that vary in difficulty and emphasis to accommodate student's ability and interest.

12. A series of retail sales language lessons were developed using Marketing and Merchandising materials.

13. Series of polaroid pictures are mounted and used to show the steps in various processes.

14. Programmed materials are used in several areas. They are supported by individual discussions and problem solving sessions.

15. A card game designed by the students and instructor is used to help students learn capitalization skills.

16. Programmed texts are used in a few areas to polish basic skills.

17. Sound filmstrips used in several areas with projectors that are designed for viewing by one to three persons. These are student operated.

18. Students in two areas are learning new words through the use of a modified tape recording machine utilizing cards with a strip of magnetic tape attached.

19. Films, filmstrips, and sets of slides produced by industry are available for loan or purchase - several areas use them.

20. Teacher produced manuals are used for training checker-cashiers and dry cleaning counter girls.

21. A few games are used in mathematics. The structure and strategy of games provide entry into a wide range of mathematical concepts.

22. Pre-recorded vocabulary tapes are used by students who need work on pronunciation.

23. Industry-produced charts and posters are used by several instructors.

24. Samples or portions of garments are made up showing steps and/or techniques of clothing construction. These are displayed on a series of flip charts.

25. Selected printing jobs are accepted from within the school district if they can be fitted into the training schedule.

26. Students browse and select books on art. They are encouraged to take these home for reading. If the book is a paperback they may keep it.

27. Glaze charts for the four kinds of clay used in art have been presented in four different ways -- mosaic, windchime, freeform mosaic, and relief. These charts, while primarily informative, have also had a motivating effect on students.

MOTIVATIONAL DEVICES

1. Art Shows - Several Art Shows have been set up at W.O.C. and at other places around the city. Work that is on display is also for sale. Most students find greater reward in the fact that people actually liked their work well enough to buy it -- money received seems to be secondary.

2. Coupons - Students receive a coupon worth ten cents for each class they attend. Coupons may be redeemed for lunches, dry cleaning, or automotive service. This system is very popular with the students. It generates several positive effects within our program in addition to providing immediate reinforcement of attendance.

3. Student Projects - Student owned engines, radios, etc. and private non-school equipment are worked on with much more enthusiasm than school training equipment.

4. Polaroid Camera - Pictures are taken of the student at the beginning of a sewing project, as it progresses, and at its completion. These pictures along with samples of the material and different details are mounted on an accordion-pleated story board. Students stop frequently to look at their progress and the progress of others. They also get great pleasure out of bringing in their friends to show them what they have accomplished.

5. Short Term Assignments - Short term assignments have been found to be one of the better motivational devices. A student is more likely to start and work on an assignment if he can see the end.

6. Checklist - A checklist of assignments, worksheets, projects, meetings, and activities is maintained in several areas. As each student in the class completes an activity, a checkmark is put in the proper square.

7. Successful Student Display - A large bulletin board upon which is displayed a close-up snapshot of each student who has gained clerical employment after having attended the Work Opportunity Center and has taken business training. A caption under the picture simply lists the student's name, place of employment, and type of work being performed. Some are depicted by two photos in a "before" and "after" arrangement. Prospective and beginning business students seem highly motivated by this display as they see the success being enjoyed by those pictured.

8. Time Clock - Most small engines students become hourly employees. A time clock was introduced as a training device. Use of this clock has motivated students toward better attendance. It has also simplified record keeping and provides a quick, line of sight reference showing who is in the shop. A time clock is also used in the marketing and merchandising classroom as it would be used in a place of business. Each student "punches" in or out for class as they would on a job. A student is assigned a rate per hour and calculates his earnings. Problems in determining deductions are also used. As a student progresses, his salary rate goes up.

9. Awards of Merit - An award of merit certificate is used in many areas of the Work Opportunity Center. The awards are earned by students for attending various series of classes and for completing certain tasks and assignments. For many students this may be the first such recognition they have received.

10. Insignia - Food Preparation is divided into five levels of accomplishment. Sleeve stripes are awarded to students for performance and attendance in various levels, and also inform the public of the student's position in the kitchen. Students attend and perform to be promoted from one level to another. Promotion is based on agreement of the instructor and the student department head and voted on by the entire kitchen staff.

11. Path to Charm - On "The Path To Charm" certificate, students plot their course with various colored stars as they complete units in personal improvement. Pictures taken with the Polaroid camera are inserted behind a felt paper frame on the certificate. These add recognition and a personal touch which the students need so desperately. Replacement pictures are taken and framed as the girls progress.

12. Books Expendable - This is a program which makes a variety of paperback books freely available to students. Several hundred volumes are on display, in bookstore-type wire racks, in the Reading Center. Students have complete freedom of choice in selection and are not required to seek permission before withdrawing a book. They are, however, encouraged to return the book when they have finished with it and to "swap" it for another. New titles are added each month to keep the collection up-to-date and to stimulate interest.

13. Written Contract System - Students enter into a written contract with counselors, teacher and others concerned. It "binds" both the student and the staff. He agrees to attend for a specific number of class hours, a specific number of days per week with the contract written for a relatively short period of time, depending on the resources of the student.

14. Point System - Because high school credit is important to many of our students, a point system is in effect in most areas of W.O.C. This system helps provide continuing reinforcement and facilitates record keeping and evaluation. One point is the equivalent of approximately one hour of work. Eighty points equals one credit. Fractional credit may also be recommended. This system complements the W.O.C. program.

15. Chart of Learning Units - A chart is on display in the business room depicting the various courses being offered. These courses are subdivided into fractional parts or learning units. The unique feature of the chart is in the visual subdividing. It is greatly simplified so that the student is not threatened by a feeling of insurmountable course work. Credit or check off is made early and quickly after the completion of the most rudimentary tasks. This is recorded on the business student's record card. As the student progresses through the learning units, credit and check off is given at specific junctures.

16. Field Trips - Art students have taken field trips to art museums, galleries, studios, exhibits, and theatres. Hikes and/or sketching trips have been taken to a dancing studio, the river, the downtown area, and the zoo. These trips are popular with the students and are always well attended.

17. Consultations - Individual and group consultations with students help eliminate grievances, improve attitudes, improve attendance, and make the students feel important. They also help instructors determine student needs, desires, etc. and make possible better referrals to other departments.

18. Re-Organization of Service Station - Peg board storage for tools - shelving for oil, etc. - rearranging of impulse sales items, painting back room and office, complete change of salesroom and office area. Helped establish a proprietory attitude in students - it's "our" or "my" station now.

19. Uniforms - An adequate supply of uniforms is maintained at all times at the Service Station and in the Cafeteria. This not only provides clean uniforms at all times, but has also been a definite, motivating factor in these areas.

20. Machine Parts - Students in the machine shop, on occasion, make parts for and rebuild machines that are no longer operable or are inaccurate to the point that they are of little value. This has been an excellent motivational device. A student can actually see the part that he produced functioning as a part of the machine.

21. Unstructured Time - Students are invited into the sewing room to work on an interior decorating oriented craft. A variety of simple projects have been completed. Each student keeps his project. A number of students who previously had little or no contact with each other have worked together in an atmosphere of friendliness and cooperation. These sessions are unscheduled, but generally take place once every four to six weeks.

APPENDIX C

CASE STUDIES

Case Study #1

General Information

The 16 year old boy who is the center of this study was one of the first students in the machine shop. His step-father with whom he apparently had a good relationship had passed away. He had never known his natural father who also was deceased. The boy was very much in need of a male adult authority in his life. Until recently his friends were a rather wild pair of buddies of negative influence. The boy has much potential but needs guidance during these critical years.

In elementary school our subject had displayed great amounts of nervous energy, had an appealing personality, but tended to be speedy and careless in school work. However, he did fairly well with his average abilities (except in language and spelling).

In junior high his achievement was slightly below average but he was judged well above average on most personality trait scales. The ninth grade was spent in a private parochial high school where the same pattern of low-average grades continued. Interest in school was beginning to lag.

He entered a neighborhood public senior high school where failures and poor attendance patterns began to develop. Finally, after only a few weeks in the eleventh grade, he dropped out. A few months later he entered W.O.C.

Methodology and Results

Much time was spent making friends and gaining the student's respect. At this time the shop was not very well equipped. Time was spent setting up cabinets and equipment. There was plenty of time to talk. Much conversation centered around his behavior. He became less and less interested

in his friends.

To demonstrate to the student that he was trusted, the instructor showed him where the keys to the cabinets were kept. The next day the student suggested very strongly that the keys be kept somewhere else. Later, he said that he had inadvertently told his friends where the keys were.

Over a period of time he was invited and had dinner at the instructor's house several times. He enjoyed this very much.

He finally decided to go back to high school and attempt to earn a diploma. At this time his mother moved to a trailer camp in a small town.

He entered a new rural high school but soon had trouble and left the school. He came back to WOC and wanted to attend but didn't have any place to live. He then decided to enlist in the service where he is at the present time.

Prognosis

While at WOC, the boy took an active part in furthering his education and toward becoming a success. He earned an additional 6 credits and was elected by his peers to serve on the student advisory committee. For this he received a commendation from the Principal of WOC. He had always planned to enter the service and had stated that it was his desire to be reliable, become a machinist, and have a new house and car eventually. He had an excellent attitude upon leaving here and, under fortunate circumstances, should fulfill all of his aims.

Case Study #2

General Information

This student, a high school graduate, was a tall thin boy who came to the Center with an intense desire to achieve but was handicapped by a

severe speech problem and its attendant emotional difficulties. His parents reported that his speech was unintelligible until about eight years of age. Speech therapy in the early years had been abandoned as ineffective. He now has normal vocabulary, but still mispronounces words and substitutes one sound for another. Results of recent individual intelligence tests place him in the average range of mental ability. Achievement tests indicated approximately fourth grade arithmetic and first grade reading ability. Vision and hearing tests revealed no unusual losses. Observations, referral information, and test findings suggest that the boy was beset by anxieties with feelings of inadequacy and fear of failure. These interfered with academic progress and social development, but he was able to graduate with much time spent in remedial and special classes.

He has been successfully employed in the past at part-time jobs of a dead-end nature. He has interest and ability in mechanics and seems to prefer solitary pursuits. Home conditions and relationships are reportedly satisfactory, and he has been given much encouragement by the parents. He usually puts forth good effort and came to the Center "training-ready" but needing the kind of individual support and guidance that WOC could provide to build up his self-image.

Methodology and Results

In Machine Shop, this student was treated in a kind, adult manner as an apprentice in a shop. Because of his mechanical nature and ability to reason well, he was able to progress from simple operations to more complex ones rather steadily as he worked at jobs producing parts and tools for the shop. As questions and problems arose, they were answered by the instructor showing "how" and telling "why". The student was cautious, neat, and clean and there was no problem in promoting safe work and dress habits.

Because of his severe reading disability, no reading assignments were given. Instruction was individual and verbal. Demonstrations were provided when they were needed in the course of assisting the student to solve production problems.

With this student, a "self-discovery" method of instruction seemed to work quite well. Problems in procedure of operations were posed (by the nature of the projects themselves) and the student formed a tentative solution which was discussed and checked orally with the instructor. The student was encouraged to set up the sequence of operations in the performance of a job himself. The instructor observed and guided during performance of operational steps. Later the instructor and student would go back over the sequence of operation performed to see how it could have been done faster and better. A close working relationship was developed. Together, the check list of operations was gone over continually, noting the level of skill development at each checkpoint. We noted his increasing ability to provide unique solutions to machine shop problems.

During the course of the year he made a collet, a tool holder for the milling machine, and various items needed in the machine shop. His work was accurate, but slow. He is now working on a project of machining up a casting which is one of the final projects required.

Prognosis

Even though he has progressed in machine shop and seems happier and better adjusted, he feels that he is not ready to face the responsibilities of a job in a machine shop. Because he is punctual, reliable, and motivated, he should eventually be able to function very well in a shop where no reading is required, but at the present time his lack of security makes job placement inadvisable.

Case Study #3

General Information

_____, 20 years old, was a college dropout. He had attended the university and had failed miserably. Although non-verbal intelligence tests showed good ability, his reading was poor and his academic interest nil. His father had been a machinist and he showed interest in machine shop training.

Previous shop work indicated that he had a great deal of mechanical ability. His reading level (grade 9) was such that it did not interfere with his ability to read blueprints.

Methodology and Results

He was able to learn the operation of the horizontal milling machine, the lathe, and the drill press. Even in the area of reading blueprints and mathematical calculations, he learned quickly.

Instruction was primarily verbal, given on a one-to-one basis directly at the machines with the instructor first explaining and demonstrating. Safety standards of dress and conduct were stressed at the outset and no deviations were allowed. After basic precautionary instructions, the student was encouraged to explore the capabilities of the machine. Actual, useful tool and part construction projects were the vehicle for instruction. Speed and accuracy as required by industry was stressed as performance standards. Group activities were minimal, as were extensive reading assignments. During the course of the year he constructed two balance devices to be used in research, milled a V-block, constructed a tool holder, and assisted in setting up and leveling a milling machine.

He is working part-time and is involved in the U.S. Olympic Hockey Program, and has made good progress in the machine shop training.

At the present time he seems to be undecided as to his vocational plans having a conflict between his desire to play hockey and obtaining employment as a machinist.

Prognosis

Further training and a resolution of his occupational goals must be forthcoming before job placement, but his ultimate success on the job as a machinist is not in doubt.